

Quaternary Period

1.8 million years ago to the present (Two Epochs)

Pleistocene Epoch

1.8 million to 8,000 years ago

There were at least four glacial advances during the Pleistocene epoch, or Ice Ages. Most notably during this epoch, *Homo sapiens*, or humans, evolved – probably in Africa. During the Ice Ages, woolly mammoths, mastodons, and woolly rhinoceroses were common. During the warmer periods, giant ground sloths, saber-toothed cats, lions, wolves, bison, camels, cattle and horses were common. Many of the large mammals went extinct at the end of this epoch. Some scientists think that it may have been due to hunting by the early humans, but no one knows for sure.

Holocene Epoch

8,000 years ago to present

The climate of the present epoch is much warmer than the climate of the Ice Ages. Humans may be playing a role in this global warming. The human population continues to expand. Humans are playing a greater role in causing extinctions, particularly in the rain forest regions of the world.

How do geologists determine the age of a rock formation?

They use two methods: relative dating and absolute dating.

Absolute dating is used for metamorphic rocks and igneous rocks, such as the granodiorite at Stone Mountain. This method is based on the natural decay of radioactive elements found in some rocks. As a radioactive element decays, it changes into a different element (a breakdown product). This decay rate is constant over time and can be observed and measured in the laboratory. Knowing the decay rate for a given element, geologists can calculate the approximate age of a rock. They measure the amount of the original radioactive element still left in the rock and compare it to the amount of the breakdown product found in the rock. This technique can provide an approximate date for when an igneous rock, such as granodiorite, crystallized from magma.

Relative dating is much less precise and depends on the relationships between rocks. For example, in undisturbed sedimentary rocks, the *oldest* layer is always found at the bottom. And, rock units that cut across, or intrude into other rocks are *younger* than the rocks they cut into. Geologists also use fossils in sedimentary rocks to help them determine the relative ages of these rocks. Rocks that have the same or similar fossils are most likely the same age.

Using relative and absolute dating, geologists can piece together a geologic history of the earth. As they make more observations of rocks, they may discover new relationships between various rock units and, as a result, they may need to recalculate dates. Geologists are constantly looking to improve the geologic time scale and they revise it regularly.

